Abstract 3662; Table

	Fractionated treatment	Single dose	Significance
Age, median, years (range)	59 (28 - 85)	66 (23 - 86)	$P < 0.001$
Tumor volume, median, cc (range)	1.04 (0.1 - 10.5)	0.6 (0.1 - 4.6)	$P < 0.001$
Cystic tumor	16 unknown: 16	12 unknown: 36	$P = 0.068$
Dmean tumor, mean Gy (RBE) $_{(range)}$	52.7 (46.6 - 56.8)	13.1 (10.9 - 24.0)	-
Dmax brainstem, mean Gy (RBE) (range)	49.5 (6.5 - 57.9)	9.8 (0 - 13.7)	-
Dmean cochlea$_{, mean Gy (RBE) (range)}$	43.4 (1.4 - 53.9) unknown: 7	8.8 (0.3 - 12.4) unknown: 50	-
Facial paresis *	2	0	-
Trigeminal neuralgia*	6	2	OR: 5.089, $p = 0.0496$
Severe dizziness*	6	7	-

*New onset or increase in symptoms; PT as primary treatment

long-term toxicity. Radiotherapy with proton therapy may improve patient outcomes by reducing radiation dose to surrounding normal tissues.

Materials/Methods: Chart review and volumetric MRI-analyses were performed on vestibular schwannoma patients treated with proton radiotherapy (PT) between 2003-2018 at a single institution. Patients with a minimum radiological follow-up of 12 months were included. Tumor control was defined as not requiring salvage treatment. Available toxicity data were collected.

Results: Of 276 identified patients, 221 patients met the inclusion criteria. Tumor control was 96% with a median radiological follow-up of 4.4 years. The majority of patients (62%) received single fraction proton stereotactic radiosurgery (PSRS), and the remaining (38%) received standard fractionated therapy. Fractionated radiated patients had larger median tumor volumes and larger extracanalicular tumor diameters at baseline ($p < 0.001$). Cystic tumors showed an increased shrinkage rate after treatment, although this did not reach significance ($p = 0.084$). Facial paresis was seen in 1%, trigeminal neuralgia in 4%, hydrocephalus in 2%, and severe dizziness in 6% of patients receiving proton radiotherapy as primary treatment. Trigeminal neuralgia occurred more often in patients with larger tumor volumes (OR 1.44, p-value 0.005) and in patients that received fractionated therapy (OR 5.0, $p = 0.0496$). Cochlear mean doses were 8.8 and 43.4 Gy (RBE) for PSRS and fractionated patients, however with wide ranges (0.3 - 12.4 and 1.4 - 53.9 Gy (RBE)). Audiological follow-up was available for 51 patients. Median maximal speech discrimination decreased from 78% to a one-year post-irradiation of 54% to last follow-up (median 48 months) of 33%.

Conclusion: Proton radiotherapy for vestibular schwannoma achieves high tumor control and reasonably low toxicity rates. Some sequelae of radiation (vestibular functioning, cognitive functioning, quality of life) warrant further evaluation. Patient subgroups that may significantly benefit from proton therapy should be identified to merit its higher costs as compared to photon therapy.

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3663

Assessment Of The Alpha/Beta Ratios Of Pituitary Adenomas And Craniopharyngiomas For The Quantification Of Single Fraction Equivalent Dose Benefits From Hypofractionated Radiosurgery

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Purpose/Objective(s): Hypofractionated radiosurgery (HFSRS) has been recently considered as an alternative to stereotactic radiosurgery (SRS) of lesions close to the anterior visual pathway (AVP). To estimate and quantify a possible benefit from HFSRS versus SRS, the value of the alpha/beta ratio has to be known, for both lesions and organs at risk, primarily the AVP. Recently the α/β ratio for the AVP has been found to be relatively small (1.03 Gy) and published by our group. While a/b ratios for Meningiomas and Chordomas have been investigated and mentioned in the literature, α/β ratios for Pituitary Adenomas (PA) or Craniopharyngiomas (CFG) have never been published to the best of our knowledge.

Materials/Methods: The α/β ratios of PA and CFG were estimated from meta-analyses of studies on treatments performed including stereotactic radiosurgery, hypofractionated radiosurgery, and conventional radiotherapy, using the Fraction Equivalent (FE) plot method. Following inclusion criteria were applied: studies published between 2000 and 2018, follow up period of at least 18 months, overall tumor growth control of at least 90% for PA and at least 70% for CFG. 31 studies with fraction numbers $1-30$ were included to assess the α/β ratio of PA, while 35 studies with fraction numbers $1-31$ were included to assess the α/β ratio of CFG. Clinical data provided from our center were added, including HFSRS treatments for 41 PA and 10 CFG, and SRS treatments for 84 PA and 8 CFG, with a mean follow up period of 23 months (HFSRS) and 27 months (SRS).

Results: The FE plot method revealed an α/β ratio for non-functional PA of 5.81 Gy, confidence interval [5.31-6.27 Gy]. No meaningful α/β value could be determined for functional PA. Functional PA require relatively high single fraction doses (generally 25-30 Gy to the tumor margin) to achieve local control, doses that fall far away from the commonly accepted range of the validity of the Linear Quadratic (LQ) model, which is the basic model for the FE plot method. For CFG we found an α/β ratio of 2.42 Gy, confidence interval [1.88-2.91 Gy].

Conclusion: As expected, both α/β ratios for non-functional PA and for CFG are much larger compared to the α/β ratio of the optic pathway. A significant benefit from HFSRS relative to SRS can be expected and calculated for non-functional PA and, to a lesser extent, for HFSRS of CFG when located close to the optic system. No meaningful α/β value could be determined for functional PA. An increased Single Fraction Equivalent Dose (SFED) of up to 17% for non-functional PA and of more than 5% for CFG can be achieved with optimized HFSRS schedules.

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3664

Changes In The Size Of Large Metastatic Brain Tumors During Fractionated Stereotactic Radiotherapy

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